

Optimal Investment Strategies for Product-Flexible and Dedicated Production Systems under Demand Uncertainty

VERENA HAGSPIEL

*Department of Econometrics and Operations Research and CentER,
Tilburg University*

Abstract

This paper studies the optimal investment strategy of a firm having the managerial freedom to acquire either flexible or dedicated production capacity. Flexible capacity is more expensive but allows the firm to switch costlessly between products and handle changes in relative volumes among products in a given product mix. Dedicated capacities restrict to manufacture one specific product but for lower acquisition costs. Specifically, I model the investment decision of a monopolist selling two products in a market characterized by price-dependent and uncertain demand, in a continuous time setting.

I find that flexibility especially pays off when uncertainty is high, substitutability low, and profit levels of the two products are substantially different. In the flexible case, the firm just produces the most profitable product under high demand, while if demand is low the firm produces both products to make total market demand bigger. In the dedicated case the firm invests in both capacities only if the substitutability rate is low and profitability of both products high enough. Otherwise, it restricts investment to one dedicated capacity for the more profitable product.

Considering a firm's decision to change from dedicated to flexible capacity, it is shown that despite perfectly positively correlated demand the firm will undertake this switch even for very low demand cases if the profitability of the products is substantially different. The option to increase total capacity accelerates investment in flexible capacity when the profit levels of both products are high enough.